February 22, 2013

FILED ELECTRONICALLY

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street N.W.
Washington, D.C. 20544

Re: Notice of Written *Ex Parte* Presentation – Petition for Rulemaking RM-11640
Amendment of the Commission's Rules to Establish a Next-Generation Air-Ground Communications Service on a Secondary Licensed Basis in the 14.0 to 14.5 GHz Band

Dear Ms. Dortch:

The Satellite Industry Association ("SIA")[1] hereby provides notice of a written *ex parte* presentation, attached hereto, in Docket #RM-11640. The attached *ex parte* presentation responds to certain additional technical information provided by Qualcomm Inc. ("Qualcomm") in its December 19, 2012 *ex parte* submission ("*Ex Parte*") in this docket regarding its proposed secondary Next Generation Air-to-Ground Service ("Next-Gen AG") service in the 14-14.5 GHz band ("Ku-band").

[1] SIA is a U.S.-based trade association providing worldwide representation of the leading satellite operators, service providers, manufacturers, launch services providers, and ground equipment suppliers. Since its creation more than fifteen years ago, SIA advocates for the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business. SIA Executive Members include: Artel, Inc.; The Boeing Company; The DIRECTV Group; EchoStar Satellite Services LLC; Harris CapRock Communications; Hughes Network Systems, LLC; Intelsat, S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; LightSquared; Lockheed Martin Corporation.; Northrop Grumman Corporation; Rockwell Collins Government Systems; SES S.A.; and Space Systems/Loral. SIA Associate Members include: AIS Engineering, Inc.; ATK Inc.; Cisco; Cobham SATCOM Land Systems; Comtech EF Data Corp.; DRS Technologies, Inc.; Encompass Government Solutions; Eutelsat, Inc.; Globecomm Systems, Inc.; Glowlink Communications Technology, Inc.; iDirect Government Technologies; Inmarsat, Inc.; ITT Exelis; Marshall Communications Corporation.; MTN Government Services; NewSat America, Inc.; O3b Networks; Orbital Sciences Corporation; Panasonic Avionics Corporation; Spacecom, Ltd.; Spacenet Inc.; TeleCommunication Systems, Inc.; Telesat Canada; TrustComm, Inc.; Ultisat, Inc.; ViaSat, Inc., and XTAR, LLC.

Specifically, SIA's attached *ex parte* presentation discusses the implications for existing FSS satellites to the Rise over Thermal ("RoT") threshold at the receiving Ku-band transponder from Qualcomm's proposed Next-Gen AG service. SIA calculates that with a maximum Next-Gen AG ground cell architecture of 250 cells, the maximum uplink EIRP density of each cell must not exceed -8.4 dBW/50MHz, which would ensure that the RoT at the receiving satellite's transponder would not exceed 0.33%. Following further technical analysis, SIA believes that the next generation of Ku-band satellites would experience the same level of unacceptable interference from Qualcomm's proposed operations as existing satellites, despite SIA's earlier suggestion that technical advances to enhance throughput could make them more susceptible to such interference.

Further, the attached *ex parte* presentation examines several assumptions and calculations by Qualcomm regarding the current operations and characteristics of VSAT terminals in the Ku-band. SIA asks Qualcomm to provide the factual basis and other information associated with Qualcomm's statements. SIA also addresses the potential for interference into Next-Gen AG ground stations from adjacent FSS earth stations and Qualcomm's proposed interference mitigation technique.

Based on the record before the Commission, SIA contends that the proposed Next-Gen AG system would cause interference to existing FSS satellites, thus requiring further reduction in the EIRP density of the Next-Gen AG transmissions in the direction of the geostationary arc. Additionally, the Next-Gen AG system cannot operate in the 14.0 – 14.5 GHz band without experiencing harmful interference and severe service degradation. Accordingly, SIA is of the view that Qualcomm's proposed Next-Gen AG should not be considered in a formal NPRM.

A copy of this notice and attached *ex parte* written presentation are being emailed to the Federal Communications Commission staff identified below.

Please contact Patricia Cooper if you have any questions.

Respectfully submitted,

/s/
SATELLITE INDUSTRY ASSOCIATION

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Attachment
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The Satellite Industry Association ("SIA") has reviewed Qualcomm's Ex Parte presentation dated December 19, 2012 concerning the proposed operation of a Next Generation Air-to-Ground Service ("Next-Gen AG") in the 14 – 14.5 GHz band. Below are SIA's comments.

1) Protection of receiving geostationary ("GSO") satellites operating in the fixed satellite service ("FSS")

In its October 22nd and December 11th Ex Parte presentations, SIA provided calculations that demonstrated the impact of the proposed Next-Gen AG ground-to-air transmissions on existing receiving co-frequency GSO satellites that utilize the 14.0 – 14.5 GHz band to provide service to the contiguous United States ("CONUS"). SIA's analysis showed that with a maximum Next-Gen AG ground cell architecture of 250 cells, the maximum uplink EIRP density of each cell must not exceed -5.4 dBW/50MHz. This would ensure that the Rise over Thermal ("RoT") at the receiving satellite's transponder would not exceed 0.33%. In order to protect more sensitive satellite receivers (i.e. those with (average) uplink G/T values in excess of 6 dB/K), an additional "safety margin" of 3 dB should also be considered. Accordingly, the EIRP density of each Next-Gen AG small cell should not exceed -8.4 dBW/50 MHz (-5.4 dBW/Hz – 3 dB).

2) VSATs

In its December 19th Ex Parte, Qualcomm has made a number of assertions regarding VSATs and the operation of satellite transponders. However, Qualcomm has not provided any factual data to support its assertions. SIA requests that Qualcomm provide this data. Nevertheless, SIA addresses these points individually.

2a) VSAT protocol and terminal type assumed by Qualcomm

In its Ex Parte, Qualcomm indicated that the VSAT interference analysis that it had conducted was independent of any specific terminal type or contention protocol.

Concerning the VSAT contention protocol, SIA points to the Reply Comments of Qualcomm Incorporated, dated July 31, 2012. In page 8 of that submission,

Qualcomm stated the following concerning how it calculated the number of VSATs that operated simultaneously within the same 50 MHz frequency:

> *"In Section 3.3.3 of Appendix A of the Petition, Qualcomm computed the number of simultaneous VSAT terminals whose aggregate power would saturate the transponder. That is, the 5,500 VSAT terminals used in the calculations is the number of VSAT terminals that are simultaneously transmitting at a given point in time, whereas the 60,000 VSAT terminals mentioned in SIA comments is the total number of VSAT terminals that are operating but not necessarily transmitting at a given point in time. Assuming the VSAT terminals transmit data 10% of the time,[14] the effective total number of VSAT terminals in operation (not necessarily those transmitted simultaneously, from which the 5,500 number was derived) is close to the number suggested in SIA comments."*

In footnote 14 of that filing, Qualcomm stated the following:

> *"VSAT terminals typically use slotted Aloha multiple access protocol. Slotted Aloha's maximum theoretical throughput is 36% but in order to avoid large delays, the system is usually run at traffic loading of 70% or less, resulting in an effective maximum throughput of 25% per VSAT terminal. However, the actual offered traffic from a VSAT terminal on average is likely much lower than the 25% limit per terminal and 10% average VSAT utilization may even be on the high side. In any case, there is plenty of margin in the C/(I+N) received at the aircraft for the proposed Next-Gen AG system parameters, and variations in VSAT traffic loading only slightly reduces the available margin and has no impact Next-Gen AG system performance."*

Qualcomm has used the VSAT contention protocol to confirm/justify the number of simultaneously transmitting VSATs and the corresponding VSAT deployment density that it used in its interference analysis. In other words, although Qualcomm's VSAT interference analysis may itself be independent of the VSAT protocol, the protocol has been used to justify the basis for the analysis. Therefore, Qualcomm's statement in its December 19, 2012 Ex Parte to the effect that its interference analysis is independent of the VSAT protocol is somewhat incongruous.

Concerning the VSAT terminal type, SIA refers to Qualcomm's July 7, 2011 submission. Specifically, on pages A-14 and A-15 of its submission Qualcomm states the following:

> *"Table A.7 shows two types of antennas that are used in interference calculations. Antenna Type B is used to analyze the potential interference from VSAT terminals, whereas Antenna Type A is used to analyze potential interference from NGSO terminals and hubs."*

Later on pages A-28 and A-29, Qualcomm refers to off-axis gain characteristics (and gain roll-off) of Antenna Type B in its analysis of VSAT interference into Next-Gen AG airborne receivers.

Qualcomm has made use of the specific off-axis antenna gain characteristics that were representative of a certain type(s) of unnamed VSAT terminal(s). It is therefore surprising that Qualcomm suggests in its December 19, 2012 Ex Parte that its VSAT interference analysis is independent of a specific terminal type.

2b) <u>VSAT EIRP</u>

In its December 19, 2012 Ex Parte, Qualcomm states, again, that the EIRP level of 40 dBW that it has assumed for VSATs is typical of all VSATs. It also states that the "overwhelming majority" of VSATs will have low transmit EIRPs. Qualcomm also states that its interference analysis is not dependent on the exact VSAT EIRP.

SIA requests that Qualcomm provide factual information capable of corroborating the 40 dBW assumption. In the absence of such information, SIA disagrees with Qualcomm's assertion that a VSAT EIRP value of 40 dBW is representative of VSAT transmission as whole and thus an appropriate value to use for interference calculations.

Section 25.134 of the Commission's rules contains the primary operating conditions for routine licensing of VSATs. This rule specifies that if the power density of a digital VSAT carrier (being fed to the VSAT earth station's transmit antenna) is limited to no more than -14 dBW/4kHz (equivalent to -50 dBW/Hz), it would

meet one of the conditions for routine licensing.[2] Additionally, Section 25.212(c) of the Commission's rules states that in the 14.0 – 14.5 GHz band, an earth station employing an antenna with an equivalent diameter of 1.2 meters or greater would be routinely processed provided that the aforementioned power density limits are not exceeded. An earth station also must be compliant with the off-axis EIRP density limits specified in Section 25.218 of the rules.

The EIRP that any VSAT terminal transmits is predicated upon many factors such as the carrier characteristics, the desired link availability, the location of the terminal within the satellite receiving coverage contour, the transponder characteristics of the satellite that it is communicating through and the level of adjacent satellite interference. In its analysis, SIA has placed no bias on what the maximum EIRP of the VSAT terminal can be; rather on what the current domestic regulations permit, which are based upon maximum power and EIRP density levels. SIA also notes that some of its members, who are large satellite operators, have indicated that although most VSAT terminals used by their customers operate with the maximum permitted FCC limit for routine processing, they nevertheless coordinate with adjacent satellites to operate at density levels in excess of those limits.

Concerning Qualcomm's assertion that its analysis of interference into the Next-Gen AG aircraft from VSAT earth stations is independent of the exact value of EIRP or protocol of VSATs, SIA refers Qualcomm to Table A.15 of Appendix A of its July 7, 2011 submission. Specifically, in that table, Qualcomm calculates the predicted carrier-to-interference ratio into a Next-Gen AG aircraft receiver from other interfering VSATs using a maximum EIRP value of 40 dBW for a single VSAT earth station in conjunction with an assumed 193 interfering VSATs within the field of view of a receiving Next-Gen AG aircraft. As stated in section 2a, above, Qualcomm apparently used a 10% activity factor that it associated with most or all VSAT networks utilizing an ALOHA contention protocol, to show that the number simultaneously interfering VSAT stations (i.e. the VSAT deployment density) that it had assumed was correct, even if SIA's number of VSATs that were co-frequency with the Next-Gen AG system in any 50 MHz band was used as a baseline value. Thus, it would appear that Qualcomm's interference analysis is, in

[2] Section 25.134 of FCC rules specifies separate, higher EIRP limits for the routine licensing for analog VSAT carriers.

fact, dependent on the exact VSAT EIRP considered in the analysis – but the assumed levels are below actual VSAT operating levels.

2c) Higher EIRP VSAT terminals

In its December 19, 2012 Ex Parte, Qualcomm states that the number of VSAT terminals that operate with higher EIRPs are in the small minority and that such stations would generally use large antennas (instead of higher power amplifiers) to increase their transmit EIRP. SIA requests that Qualcomm provide factual information capable of corroborating this assumption.

2f) Transponder Saturated Flux Density ("SFD") setting

In its December 19, 2012 Ex Parte, Qualcomm states that the satellite SFD value that Qualcomm assumed in calculating the level of interference into its Next-Gen AG system from VSAT networks was typical of the values that the satellite operator can choose to support low-cost, low-EIRP terminals. Moreover, a satellite operator would not use higher SFD values because that would force the VSAT terminal to operate with a higher EIRP, and thus impose cost on the VSAT customer and result in higher interference to adjacent satellites.

SIA disagrees with Qualcomm's assertions. With regard to the typical transponder SFD, SIA provided in its Ex Parte of December 11, 2012 data from the FCC's own records that showed that the SFD value assumed by Qualcomm was atypical and would likely correspond to an inefficient use of the transponder, especially when other non-VSAT type carriers that a transponder is expected to support are considered.

With regard to adjacent satellite interference, a satellite operator coordinates with other adjacent operators the maximum uplink and downlink (transmission) density levels for its satellite. This coordination is typically completed prior to the start of operation of the satellite at the specific orbital location. Before contracting with a prospective VSAT customer, the satellite operator informs that customer of the (coordinated) levels of adjacent satellite networks, i.e. the interference environment within which it will operate, as well as the uplink and downlink (power or EIRP) density levels that its carrier(s) must not exceed. As long as the VSAT customer operates in a manner that is consistent with the satellite operator's

conditions (and the FCC's regulations), adjacent satellite interference is not an issue.

With regard to the costs associated with the operation of any individual VSAT terminal, this is an issue that is determined by the VSAT operator. If that operator believes that its remote business location is better served by operating a VSAT terminal with a higher EIRP – whatever the definition of higher EIRP may be – even with the added costs, then that is what it will do. SIA did not make any assumptions regarding the characteristics or costs of a VSAT terminal.

2g) Satellite transponder usage by VSATs with large antennas

In its December 19, 2012 Ex Parte, Qualcomm states that for VSATs terminals that use higher transmit EIRP and larger antennas the operator would most likely use a large portion of the transponder exclusively, such as TDMA terminals that SIA mention. SIA disagrees with Qualcomm's assertion.

A VSAT network provides communication between numerous remote terminal locations with one or multiple hubs. The specific operating characteristics of a VSAT terminal are dependent on the carrier characteristics, the characteristics of the satellite, the desired link availability and the location of the terminal station. In this regard, a VSAT operator may choose to have a remote terminal that it is located in a high rain zone or is at the lower gain contour of the satellite's receive beam contour to operate with a larger antenna and/or higher EIRP so as to maintain the desired link availability, as determined by the VSAT operator. Such operation has very little impact, if any, on the amount of bandwidth that a satellite operator devotes to the VSAT network. The amount of transponder bandwidth that is required by a VSAT network is determined by the VSAT operator and made available to it through a commercial contract between the satellite operator and the VSAT operator prior to the start of operations.

2h) Calculation of the satellite SFD

In its December 19, 2012 Ex Parte, Qualcomm states that SIA's computation of the total EIRP projected toward the GSO satellite arc by multiplying the total VSAT population by the maximum possible EIRP value would generate a completely unrealistic value. It is assumed that the Qualcomm comments refer to the total VSAT population that is transmitting to a single target satellite within a given 50

MHz that SIA incorporated in the calculations that it provided in its December 11, 2012 Ex Parte.

SIA stands by the calculations provided in its December 11 Ex Parte. The calculation is relatively simple and straight forward and shows that it is does not result in excessively high levels of flux density that would overdrive a satellite transponder. Specifically, the flux density within any 50 MHz satellite transponder is determined through the summation of the EIRP of each VSAT terminal that communicates with a satellite within the pass-band of the transponder and then subtracting the spreading loss, which for simplicity was assumed to be approximately the same for all VSAT links. SIA requests that Qualcomm provide more specificity as to what it finds to be unrealistic.

It should be noted that satellite operators typically budget for adjacent satellite interference by assuming that the earth stations associated with an adjacent satellite operate at the maximum FCC power density limit (or at a higher coordinate level) with an agreed upon off-axis antenna gain envelope which is typically that of Section 25.209.

3) Interference into Next-Gen AG network

3a) Interference into Next-Gen AG ground stations from FSS Earth station transmissions

In its Ex Parte, Qualcomm states that for the case where there was a 30% capacity reduction, it would consider such an interference scenario as short-term because it would be primarily due to the temporary operation of high power mobile transmitters that use a transponder's entire spectrum that is placed very close to the Next-Gen AG ground station for short-term need. SIA does not understand why Qualcomm is of the view that the operation of such FSS earth station near a Next-Gen AG ground station would be of a temporary nature.

An earth station operator places its facility at any location that it finds feasible. Many factors go into the choice of a suitable site – among them are local zoning restrictions, site lease costs, location of the site within the receiving contour of the satellite with which it would communicate, obstruction profile of surrounding terrain and length of operation. An earth station operator may desire to place a permanent earth station very close to an existing Next-Gen AG ground station

because it finds that location to meet its requirements. Under such a scenario, the earth station operator would expect the Next-Gen AG operator to accept any interference or to relocate its ground station.

It typically takes several months for an earth station operator to identify a suitable location and to secure the necessary authorization for an individually licensed earth station. So, if an FSS earth station is located permanently near an existing Next-Gen AG ground station, the 30% loss in capacity (due to the FSS earth station's wideband transmissions) would be of a medium-term or long term nature – not short-term – as it would take some time until the Next-Gen AG can be relocated within the cell.

3b) Next-Gen AG interference mitigation technique

In its Ex Parte, Qualcomm states that the proposed Next-Gen AG system uses a multi-carrier version of LTE that hops frequencies across a 100 MHz band. So, at worst, if some part of this 100 MHz band has very high interference, the system continues to operate and the loss of capacity is equal to the fraction of spectrum with high interference during which time such interference is present. Qualcomm also states that the duty cycle of VSAT terminals is typically low, and that very few Ku-band VSATs terminals near a Next-Gen AG ground station would have clear line of sight to the ground station. Hence, the combination of low density of VSAT terminals in the vicinity of Next-Gen AG ground stations, the narrow bandwidth and low duty cycle of many of these VSAT services, and the clutter and obstructions that will be present, will only cause a small fraction of the 100 MHz bandwidth to be lost.

SIA disagrees with the assumptions that Qualcomm has made regarding the level of obstruction loss that would be present between an FSS earth station and the Next-Gen AG ground station. SIA's views, in this regard, are contained in its comments of July 16, 2012 and it is Ex Parte of October 22, 2012 and will not be repeated here.

Second, with respect to the bandwidth of VSAT carriers, in its December 12, 2012 Ex Parte, SIA did not indicate that the bandwidth of VSAT carriers was 400 kHz. Rather, it simply reported the bandwidth of the VSAT carriers contained in the FCC license applications of the specific satellites that it referenced. In this regard

SIA notes that the bandwidth of carriers transmitted by VSAT networks can be smaller or larger than 400 kHz.

Third, and most importantly, the comments that SIA made in section 2.4 of its December 12, 2012 Ex Parte, pertained to the interference into the Next-Gen AG receiving system installed on the aircraft – not the Next-Gen AG ground receiver. Although Qualcomm could, over some period of time, relocate one of its ground stations to another location in order to alleviate interference issues related to a nearby FSS Earth station, the receiving aircraft would still be subjected to excessive levels of long-term interference from FSS VSAT emissions – not to mention emissions from non-VSAT Earth stations. Relocation of the Next-Gen AG ground station would not have a significant impact on the interference into the aircraft receiver. Hence, the resultant loss in the Next-Gen AG system capacity due to excessive level of interference into the Next-Gen AG receiver from VSAT transmissions would be permanent and not short-lived.

Moreover, in view of the high utilization of existing satellite transponder capacity and the high likelihood that all portions of the 14.0 -14.5 GHz band is utilized by at least one satellite and the high level of interference that any Next-Gen AG system would face from FSS Earth stations transmissions, it is debatable whether the Next-Gen AG system could find any suitable frequency segment – whether it is within a 100 MHz segment or 250 MHz, etc. – where its RA transmissions would be successfully received by the Next-Gen AG aircraft receiver.

It is interesting to note that in the first paragraph of section 2 of Attachment A of its December 19, 2012 Ex Parte, Qualcomm states that its method of computing overall VSAT interference is not dependent on any VSAT contention protocol, but it continues to cite VSAT (transmission) activity factors that are commonly associated with VSAT networks that employ the ALOHA contention protocol.

4) Additional Comments

During the proceedings to date concerning the Next-Gen AG system, Qualcomm has relied extensively on its own assumptions on the operations and characteristics of satellites, VSATs and path blockage. For example, Qualcomm continues to state that the typical uplink EIRP of a VSAT carrier is 40 dBW, or that the typical SFD of a satellite transponder is -93 dBW/m2 or a specific percentage of VSAT transmissions toward a receiving Next-Gen AG aircraft would be blocked, and the

list goes on. Qualcomm has also intentionally not considered the impact of non-VSAT emissions and has not budgeted for a level of interference from FSS earth stations that is at least consistent the FCC routine licensing regime – an assumption that satellite operators routinely make when designing their transmission links.

It is also evident that Qualcomm has not sufficiently researched the operating characteristics of existing Ku-band satellites that service the CONUS, or the authorized characteristics of earth stations – both VSAT and non-VSAT station – that operate in the United States. The majority of this information can be found through researching the FCC's database. In this regard, SIA took the laborious step of identifying the space stations that currently provide service to the United States and extracted their basic receiving characteristics by researching the FCC records. It provided this information in its Ex Parte's of October 22 and December 11, 2012.

Qualcomm has significantly underestimated the level of interference into its Next-Gen AG system from FSS earth stations. In this regard, we recommend that Qualcomm research the FCC database in order to ascertain the location of FSS earth stations operating in the 14.0 – 14.5 GHz and the characteristics of those stations and the authorized power/EIRP and density limits of those stations. It should then use the authorized characteristics or the characteristics associated with the FCC's routine licensing process, whichever is more interfering, to determine the interference into its system.

FCC proceedings are fact based proceedings. Throughout this proceeding, Qualcomm has made technical assertions and assumptions without providing any supporting data that can be scrutinized. These include the EIRP of VSATs, the number of operating VSATs, the G/T of satellites, the SFD range of satellites, the percentage of VSATs that would have path blockage towards a Next-Gen AG aircraft, and the list goes on.

It is abundantly clear from the record that the proposed Next-Gen AG system would cause interference to existing FSS satellites. Additionally, the Next-Gen AG system cannot operate adequately within the existing interference environment in the 14.0 – 14.5 GHz band. Accordingly Qualcomm's proposed Next-Gen AG should not be considered in a formal NPRM.

Conclusion

The proposed Next-Gen AG system would cause excessive levels of interference into Ku-band satellites that provide service to the contiguous United States. SIA has also shown that the various assertions that Qualcomm has continued to make about the operation of VSATs and satellites are unsubstantiated.

Further, SIA is of the view that the Next-Gen AG's system would be subjected to excessive levels of interference. It is unlikely that his interference can be mitigated by the use of LTE technology and it would at a minimum force Qualcomm's system to operate with a significantly lower capacity level. Taking all of this into consideration, SIA is of the view that Qualcomm's Next-Gen AG system should not be considered in a Notice of Proposed Rulemaking proceeding.